

Buffer solutions

1. Experimental procedures

Compounds of group A	Compounds of group B
0.1 M NaCl pH = 7.00	0,1 M NH ₄ Cl i 0.1 M NH ₃ aq. pK _a = 9.2
0.1 M Na ₂ SO ₄ pH = 7.65	0.1 M CH ₃ COOH i 0.1 M CH ₃ COONa pK _a = 4.8
	0.1 M Na ₂ HPO ₄ i 0.1 M KH ₂ PO ₄ pK _a = 7.2

1.1. The effect of addition of acid or base on the pH value of buffer and non-buffer solution

Take 30 cm³ of the solution A (depending on the choice) into the beaker in which the magnetic dipole is located and measure the pH. Then start the magnetic stirrer, dip the electrode and add 1 cm³ of 0.1 M NaOH solution (or 0.1 M HCl depending on the choice) from the burette - simultaneously taking the pH meter readings after each portion of the reagent added. The same should be done with a 30 cm³ sample, according to the choice of solution B (components mixed in a 1: 1 ratio).

Write the results in Table 2.1.

1.2. Influence of mutual molar ratio of components of buffer mixture on its pH value

Use a volumetric pipet to dispense respectively 5, 10, 15, 20 cm³ of the first component of compounds of group B into a 25 cm³ flask, and make up to the mark with a second component of compounds of group B. After thorough mixing of the contents of the flask, measure the pH value.

Write the results in Table 2.3.



2 Development of results

Table 2.1.

Volume of acid or base added [cm ³]							
pH salt solution (A)							
pH buffer solution (B)							

Table 2.2.

Concentration the I component of the buffer mixture [mol/dm ³]					
Concentration the II component of the buffer mixture [mol/dm ³]					
pH buffer solution					

- present results from experiment 1.1. in the form of a graph showing the dependence of the pH value on the amount of acid added (a titration curve).
- read from the titration curve how much acid (base) should be added to individual solutions to change the pH by one unit
- calculate what concentrations of strong acid (base) will correspond to pH values equal to the pH of buffer solutions (B).
- calculate the buffer capacity of the test solution from group B.

3. Conclusions

4. The scope of material

- buffer capacity,
- buffer solutions,
- preparation of buffer solutions.

5. References

- M. D. Joesten, J. L. Wood, *World of Chemistry*, second edition, Thomson, USA 1996
- D. W. Oxtoby, N. H. Nachtrieb, *Principles of modern Chemistry*, Saunders College Publishing, USA 1996

